(14.)

SOME REMARKS

ON THE

CAUSES OF AMPUTATION OF FŒTAL LIMBS
OCCURRING WITHIN THE UTERUS.

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THE pathology of intra-uterine amputation was until the last few years so completely enveloped in darkness, that, although these imperfections have been observed from time immemorial, still so little has been known of the manner in which they were produced, that many persons, among whom was the great Haller, entertained the opinion that they were always the result of imperfect development, alleging, in support of this opinion, that there was not one case recorded in which the "amputated hand or other limb had been found separate from the rest of the body, in the membranes of the fœtus:" whilst others, amongst whom were Richerand and Desormeaux, regarded them as a pathological change in a perfectly developed body, the result of inflammation and gangrene. It was not, indeed, until the following case occurred to Dr. Montgomery of Dublin, that the true nature of this change was found out; it was a case of abortion occurring at the fifth month. The following is his description of the fœtus:—"The head was misshapen and monstrous, the brain towering upwards like a helmet over the head, and covered only by integument; but the circumstance deserving of especial notice was the appearance of complete ligaments surrounding the limb; and on examining them closely I found that they consisted of distinct shreds, passing from both hands downwards to the legs: at one end they had formed a complete ligature round the middle of each hand, causing a distinct depression where it passed, the part of the hand below it being almost completely undeveloped: from the hands these cords descended to the legs, which were crossed, and, surrounding them, just above the ankles compressed them so tightly that fully two-thirds of their whole thickness were thereby divided, *without, however, causing any breach in the skin;* nor was there the slightest appearance of disease, or even discolouration of any of the parts; but the feet were, like the hands, imperfectly developed and misshapen."

Since that time many more cases of a similar character have been observed,—some of them where the amputations have been complete, others where they have only been partial; but most of them tending to confirm the opinion of Dr. Montgomery, that they are effected by the application of a ligature round the limb, which by its pressure gradually causes the division. As examples of the first class of cases, or those in which the amputation had been completed, I will adduce the following:—Schwabe mentions a man who had only a small stump for a left arm, and lived twenty-eight years; also a man who had only short stumps for lower extremities, but was married, and had healthy and well-formed children. Nettekovan mentions a girl, three weeks old, with deficiency of the lower two-thirds of the right fore-arm; and a child twelve years old, with defect of the lower half of the left fore-arm. There is also a preparation, in the Museum of St. Bartholomew's Hospital, of a fœtus born at the ninth month, in which spontaneous amputation of both legs a little below the knee-joint has taken place. The extremity of each stump is cicatrized and contracted to a point: it is not known what became of the separated legs. But that which has the most practical bearing, is the case related by Smith, in the Lancet for 1838. That gentleman being called to a case of excessive hæmorrhage, where it was necessary to perform the operation of turning, was surprised on introducing his hand into the cavity of the uterus at not being able to lay hold of the legs: after some difficulty, however, he succeeded in catching hold of the thighs, and thus extracted the child; when on bringing it into view he found both legs amputated, immediately below the knee, and the stumps neatly healed.

There was quite lately, in St. Bartholomew's Hospital, a case beautifully illustrating that class where the constriction does not go on to complete amputation of the limb: I refer to a boy, two and a half years of age, who was admitted on account of a slight injury, and was the subject of congenital varus of both feet. And besides these malformations of the feet, the right thigh presented an extraordinary appearance, for at the lower part, just above the condyle of the femur, was a constriction of the limb, extending quite down to the bone, on the anterior aspect; the extensor muscles apparently being completely divided. Posteriorly, the hamstring tendons, on both sides, could be felt quite whole, with the artery beating naturally in the popliteal space. The integument dipped down into the fissure in the subcutaneous tissues, and at the bottom of the depression were two lines running round the limb, and having the appearance of marks made by a tight cord: with this exception, the integument of the whole limb looked perfectly healthy and natural. There was no perceptible fissure in the bone, and the knee-joint was quite perfect in its movements, the patella also being moveable. The child was capable of both standing and walking, but did not bend the knee in progression, neither was he able to raise the leg over any obstacle that stood much above the level of the floor. In addition to these other deformities, three of the fingers on one hand, and one on the other, were imperfectly developed; not, as was first supposed, wanting altogether. There was no visible imperfection in any other organ, nor was there anything in his countenance or complexion to give rise to the suspicion that there was any imperfect development of the heart. Whilst this child was in the hospital he was attacked with erysipelas in the deformed leg, extending from the toes up to the constriction in the thigh, where it ceased quite suddenly. This attack, however, produced but very little constitutional disturbance, and passed off in a few days, leaving the limb as well as before. On mentioning to the mother that such an attack had occurred, she told the nurse that similar ones often happened, coming on generally about once a month.

Among the many pathological points arising in the consideration of these cases, the following are, I think, some of the most interesting for investigation, viz.:—What are the amputating agents? In what manner are they produced? How do they act? And what future effect do they have upon the limb in those cases where the amputation has only been partial?

In reference to the first of these questions, Dr. Montgomery believes the amputating agents to be, almost invariably, shreds of organized lymph, similar to that effused under the influence of inflammatory action in the serous membrane, although he declares his inability to account for their production; the amputations being effected by the limbs becoming encircled in these bands as in the case related by him already alluded to. Dr. Simpson, of Edinburgh, also holds the same opinion, and, moreover, considers them to be the result of some kind of inflammation of the integuments of the fœtus. Prof. Gurlt, of Berlin, likewise agrees with Dr. Montgomery, that these amputations are mostly produced by threads, but instead of considering them as shreds of lymph, he "believes that both the formation of these shreds, and the amputations of the limbs, which are most probably in all cases produced by them, may be explained by the history of the formation of the fœtus;" going on to say, "I look upon these shreds as prolongations of the egg membrane from which the fœtus grows, whether this membrane be taken as the navel, bladder, or the amnion;" in support of which opinion he mentions the case of a malformed foot, which had been adherent, at different points, to the surface of the amnion; some of these adhesions being like threads, and from two to three inches in length. These prolongations, he thinks, are afterwards, by the constant motions of the fœtus, twisted into slight but firm cords, in which the limbs of the child get entangled. Against this opinion of Gurlt, however, may be advanced the fact, that, in many cases—indeed in most—there is no connexion between the constricting band and the amnion, the cord being attached by either end to some part of the body.*

As another cause of constriction, the umbilical cord must be mentioned; for although from its elasticity and mobility it would scarcely be thought capable of producing so great an effect, still that it has such power the following examples will abundantly shew. Two cases are related by Montgomery, in which the umbilical cord was coiled, in one round the left leg, in the other round the left thigh, just, above the knee; and in both had deeply indented the limb. One by Schwabe, of a child born at the sixth month, in which the foot appeared in great part separated, just above the ankle, by the umbilical cord tied round it with a knot. Buchanan also relates a case of a three or four months' fœtus, in which the umbilical cord encircled the neck, and the right knee: the cord itself was atrophied, and at the constricted part of the knee there was only skin and bone remaining. F. C. Fourtual mentions a seven months' fœtus, in which the cord, thin, long, and hard, encircled the right upper arm near the elbow, four times, so tightly that though the skin was uninjured yet the muscular tissue appeared wholly lost. And a similar instance is related by Ninon, of a fœtus whose thigh was so constricted by the cord just above the knee that the soft parts were divided down to the bone.

In all these cases of constriction by the umbilical cord the amputation has only been partial, and I do not know of any on record where there has been complete separation of a limb from this source, although no doubt, if it were continued long enough, such would be the result. But I doubt very much whether it could be so continued, for it would most probably give rise to the death or premature expulsion of the fœtus, as in the previous cases; the cause of which I believe to be the following:—The umbilical cord, whilst pressing on the soft tissues of the limb and causing their absorption, does not suffer a sufficiently great amount of pressure itself materially to affect the blood through it; but, when all the soft parts intervening between it and the bone have become absorbed, the resistance afforded by that body, on account of its greater hardness, begins to produce counter-pressure upon the cord, thereby stopping the circulation, occasioning the death of the fœtus, and consequently its premature expulsion.

But I do not suppose that death must be a necessary consequence of such constriction, for should it be late in the period of intra-uterine life before the limb becomes entangled in the convolutions of the cord, parturition would most probably occur ere the pressure had gone on to such an extent as to cause the death of the child, although long enough to have caused the removal of the soft parts. And like circumstances, I believe, gave rise to the deep indentation in the thigh of the boy recently in St. Bartholomew's Hospital, already alluded to.

But besides the two preceding sources of division of a limb, there is yet another probable, I may almost say certain one, of which the following case may, I think, be taken as an example: it is related by Dr. Edward Martin, of Jena:—

A boy was born of healthy parents, in 1849, without his left arm; in its place there was a stump, which appeared to be somewhat less than half of the upper arm, and of which the lower end was a brownish red and moist, but not suppurating or bleeding wound, with the bone a little projecting. Shortly after birth, the wound, dressed with cerate, completely healed. The child lived and grew healthily. The stump was moveable, and its end was puckered in, and had a reddish small elevation projecting from it. The separated part of the arm of this child came away with the placenta; it was about three or four inches long, and consisted of the lower half of the upper arm, with the forearm and hand. The skin was shrivelled and brownish grey, the fingers were somewhat dried at their tips, the nails were well formed. Blood was effused in the subcutaneous tissue of the upper and forearm, but none in that of the hand; all the joints were perfect, and the tissues appear to have been well nourished. At the part where the amputation had been made, the integuments were drawn in and united with the subjacent parts, and from the middle of this end the humerus projected about an inch, and had a dentated broken surface, The mother of this child, eight weeks before her delivery, had fallen from a considerable height; she was rendered unconscious by the injury she received, and, for some days after, had bloody discharges from the vagina, and, till she was delivered, had constant pains of the abdomen. But her general health remained good, and her parturition was natural. The true source of this separation,—for the term amputation is here inapplicable,—I conceive to be a fracture, probably compound, of the humerus, occurring from the fall which the mother had eight weeks previously. That such fractures from external violence to the mother happen, is certain, and also that they may and do occur spontaneously in the uterus, and from muscular action of the fœtus itself, cases exemplifying all of these species being given by Dr. Montgomery, in his article on the fœtus in the Cyclopædia of Anatomy. It has been a matter of doubt whether separation of a limb from this accident really ever does occur, many people believing that it does not. As I have before said, I incline to the opinion that it can; the ulcerated extremity of the stump, in the foregoing case, showing it to have been quite of recent formation, and the rough and jagged appearance of the end of the separated portion of humerus decidedly proving it not to have been divided by any mechanical means, such as ligature, as under those circumstances it would have been smooth and even; but the difficulty to solve is, how the soft parts become divided. In the article on the fœtus just now referred to, a case is mentioned where the mother having fallen, caused a fracture in the leg of the child, which was born with the fracture, complicated with wounds of the soft parts; gangrene supervened, and detached entirely the injured limb. Here we have gangrene and separation after birth, resulting from injuries done in the uterus. Now, in the former case, did separation occur within the uterus from the same cause or not? The appearance of the separated part would seem to indicate that it did not, there being no more alteration in it than could be very well accounted for by its lying dead for some weeks in the uterus, whilst it certainly did not show the disorganized condition of a slough. If, then, separation did not occur from this cause, the question naturally arises, how could it take place? And, in answer, I will relate a case from Dr. Simpson's paper in the Dublin Medical Journal, which, I think, will illustrate one manner, though I do not say *the* manner, in which it might have happened. A boy, who was wanting both hands and arms, had growing from the right shoulder one finger, containing four phalanges, and from the left two shorter ones, placed vertically one over the other; the inferior of these two presented on its surface a great and sudden constriction; this finger had been fractured some years previously, and had since been gradually becoming atrophied at the fractured part, to such a degree, that if it had continued in the same course much longer it would have fallen off. This species of atrophy might truly be called disjunctive atrophy, and although in Dr. Simpson's case it was of a very chronic description, still if it took on a more active form it might in a very short space of time cause the removal of the soft parts in the arm of a fœtus: but this is only a supposition as to what might happen, I do not say that it ever does so occur.

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* Since writing the above I have met with the following case:—A child was lately brought to St. Bartholomew's Hospital, in both of whose hands some of the fingers were deficient, and some marked with constrictions. On enquiry, I ascertained from the mother that the deformity was congenital, and that bands of membrane were twisted round its hands at the time of birth. She further told me that it was her first child; that six weeks previous to her pregnancy she had had a miscarriage, followed by a constant discharge of quantities of false membrane per vaginam, which ceased on impregnation, though she suffered from occasional pain for some time afterwards. This is another proof of the assertion, that these deformities are generally caused by shreds of membrane, and in this case, most probably, the result of some inflammatory action on the uterus ittelf.

We now come to the consideration of the manner in which these constricting bands act to produce amputation; and here I would remark, we shall find some most striking differences between their action, and that of ligatures artificially applied after birth to any part of the body. When such an application is made use of by the surgeon for the removal of various kinds of tumors, separation is produced by the stoppage of the circulation in the part from the tightness of the ligature; this causes its death and disorganization, ulceration of the living tissues nearest the dead mass follows, commencing at the circumference and extending towards the centre, the skin in this instance being the first to give way. On the other hand, in several of the cases of intra-uterine amputation I have related, it is expressly stated that the skin was the last part, or nearly so, affected; absorption of all the subcutaneous tissues down to the bone being produced before it showed the least symptom of compression, beyond following the indentation of the limb. I cannot, unfortunately, find one case on record in which the constriction has extended into the bones without the amputation being complete, nor is there one where the integuments have begun to ulcerate, so that it is impossible to say which of these two hold out the longest against the constricting force. Moreover, it is evident that the separation is not the result of gangrene, for in all those cases where the separated parts have been found, they have always seemed healthy, not having suffered any discolouration or disorganization, and at the point of division being either partially or entirely healed over; though this appearance of being healed, I should think, is more probably attributable to the fact, that the skin did not ulcerate or separate until even the bone itself had been divided, rather than to any active process of repair having taken place in the amputated extremity.

Concerning the effects produced in the part of the limb situated below the seat of constriction, in those cases where the amputation has only been partial, I cannot find anywhere that they have been particularly noticed, those who relate them having been content with observing that they were nourished. There is no doubt about their being nourished in children who live, and there does not generally seem to have been any hindrances to their development and growth, although Dr. Simpson certainly mentions one in which the constricted arm was a little shorter than the other; but the greater number of these monstrosities have been aborted. But, when considering the subject of the nutrition of these limbs, we ought to take into account not only their size and arterial appearance, but also whether usually they are more or less subject to disease than the rest of the body, and whether the diseases under which they suffer are such as are generally thought to depend upon deficiency of vital power. As I have before said, I know of no such observation having been made, except in the case of the boy in St. Bartholomew's Hospital, who by his mother's account is subject to frequent attacks of erysipelas in the malformed leg, which is always defined by the constriction of the thigh; with this exception that leg appears as sound and well nourished as the other, the liability to erysipelas being perhaps merely a casual coincidence; but as in the present state of medical knowledge erysipelas is thought to belong to that class of diseases dependent on debility, I am inclined to think that its frequent occurrence in this boy's leg is a sign of its greater weakness; although before one could come to any certain conclusion on the subject, a much more ex-extended observation of similar cases would be necessary,—a matter, I fear, of some little difficulty, as there are but about half a dozen living cases of constriction on record, and I think only one or two besides this where it occurred high up in the limb.

I have stated that by many of the older observers these deformities were supposed to be the result of imperfect development, and it would seem that these suppositions were not altogether without foundation, for in many of the cases where intra-uterine amputation has taken place, malformation of some other part of the body has coexisted, as in the boy lately in the hospital, the deficiency of whose fingers was of such a nature as only to have been caused by imperfect development, all the component parts of the fingers being present, but in so undeveloped a degree that they might easily have been, and indeed were at first, mistaken for the stumps of the natural fingers, cut off at the first phalanges; a state of things which was shown not really to be the case, from the fact that at the extremity of each might be seen rudimentary nails—unless indeed there had been amputation and partial reproduction, as in the following cases related by Dr. Simpson in the Monthly Medical Journal, 1848. It occurred in a girl aged 11, who had been born without the left upper extremity from a short way below the elbow-joint. The arm of this side was of the natural size and form, but below the forearm consisted merely of a stump about two inches long. It had all the appearance of having been amputated at about the junction of its upper and middle third, the surface having subsequently healed over in a very perfect manner. No appearance of cicatrization was visible, except over the ends of the bones, where the skin was puckered and drawn in in an umbilical form. Midway between and a little in front of these points, was a raised cutaneous tubercle, divided on the surface into five minute nodules, on two of which small points of nail could be detected. This projection, Dr. Simpson stated various reasons for believing, indicated an effort of nature to replace the lost portion; he considered it, in fact, a rudimentary hand, and a curious illustration of the power of regeneration of even compound parts in the embryo. He also showed a number of casts of similar cases, in all of which the amputation had been at the same place, and in all some attempts, either more or less, at repair had taken place.

This last remark of Dr. Simpson's leads one to the investigation of what parts of the body are most subject to these amputations and constrictions; and *he* also suggests that the situations in which the membranous threads are found may afford some clue to the diseases which produce them, and the manner of their production. In running over the various cases, it will be seen that the two different sources of constriction,—namely, the shreds of lymph and umbilical cord, have two different situations, where they mostly exert their constricting power, the first being found most frequently about the roots of the fingers and toes, and the middle of the palm of the hand and sole of the foot, gradually diminishing in frequency towards the upper part of the limbs, whilst, on the contrary, the umbilical cord has a much greater tendency to encircle and constrict those parts of the limbs which are nearest to the body.

One of the principal reasons why, in many of these cases, the amputated extremity of the limb has not been found,—in so many, indeed, as to have given rise to the opinion that they were always the result of imperfect development,—depends, I believe, upon this, that the fœtus at the time of the formation of the threads is so small, that the separated portion of limb escapes unnoticed amongst the debris of membranes, &c., at the time of birth. So early, indeed, does the amputation sometimes occur, that even when the separated part has been found it has not at first been recognized.

Dr. Montgomery gives a description of an aborted fœtus which had suffered amputation of one of its legs; the stump of this leg was connected with the ankle of the opposite side by a cord, to the centre of which was attached a small oblong body, that proved on examination to be the amputated foot perfectly formed. The amputation had occurred at a very early period.

This case shows how easily a foot or other member might escape without detection: should gestation of the fœtus be continued for its full period, the cord would most probably have been detached from the stump, either by absorption, or the motions of the fœtus. The other foot, also, might have been removed by the same cord, so that the child when born would have presented precisely the same conditions as the fœtus alluded to in St. Bartholomew's Hospital Museum.

I have now stated at some length the different opinions held concerning the means by which these various malformations are produced; and that they are effected by such means I have shown by the recital of several cases bearing upon the subject; and I think I am justified in stating that at the present time but few medical men would refer their origin to any other cause; but with the extra-professional public it is otherwise, and indeed some time ago it was so with the great body of members of the profession. Of the influence which the mind has over the process of generation much has been said, some persons having attributed to it not only a power over the physical, but even over the mental faculties, considering that the transitory state of the minds of the parents at the instant of conception is fully able to account for the predominance of any particular talent or propensity in the offspring.

Whether such an influence be ever exerted in relation to the mental qualities, however, has but little to do with the present subject, which relates entirely to the physical malformations that occasionally; occur and on this point the investigation is as difficult as on the other. The vulgar opinion is, that all the various congenital physical defects, such as nævi, blemishes, or unnatural formations, are the result of some strong impulse in the mind of the mother, excited either by her imagination, desire, or fear, or indeed by any other faculty or passion that might be sufficiently strong.

But putting aside entirely all the wonderful stories, one may readily believe that the mind has some influence over the nutrition of the fœtus indirectly, though not directly, when we take into consideration the effect all violent or sudden affections or emotions of that organ in the mother have upon her general circulation, and indeed upon all her organic functions, especially when we reflect how much more liable and subject all women are to various nervous affections when pregnant, and how much more likely the uterus is to sympathize with any such disorder when in that state; since we know that, even when unimpregnated, menstruation may be suddenly arrested under similar circumstances.

With the idea, then, that the mind of the mother can influence the nutrition of the fœtus in some degree only, I will conclude the consideration of this subject by expressing the opinion of Dr. Blundell, "That it is contrary to reason, experience, and anatomy, to believe that the strong attention of a mother's mind to a determinate object or event can cause a determinate or specific impression upon the body of her child without any force or violence from without; and that it is equally improbable that, when the imagination is operating, the application of the mother's hand to any part of her own body will cause a disfiguration or specific impression on a corresponding part of the body of the child."